Title: Petards Universal Protocol User Manual

	Issue:	01	02		
Raised	Date:	04/03/2009	02/04/2009		
	Signed:	H.RAI	D.MUSE		
	Name:	H.RAI	D.MUSE		
Checked	Date:	04/03/09	02/04/2009		
	Signed:	M.MENON	M.MENON		
	Name:	M.MENON	M.MENON		
Approved	Date:	04/03/09	02/04/2009		
	Signed:	B.TAIT	B.TAIT		
	Name:	B.TAIT	B.TAIT		

NOTE: The Universal Protocol described within this document is copyright property of Petards Ltd. UK. The information in this document is issued on the understanding that no part thereof shall be copied or communicated to a third party without authorisation from Petards Ltd.

Any amendment to this document will consist of a complete re-issue

Commercial - In Confidence

This document, including any following pages is confidential. The information it contains is to be only used for the purpose previously agreed with the named recipient. If the reader of this document is not the intended recipient you are notified that improper use of the information contained herein or any unauthorised copying and distribution is prohibited.

Contents:

1. Scope 3
2. Change History 3
3. Applicability 3
4. Related Documents 3
5. Hazards and Notes 3
6. Process flowchart 3
7. Introduction to Universal Protocol (UP) 4
8. CAMERA COMMANDS 5
9. PAN/TILT COMMANDS 12
10. VIDEO RECORDER COMMANDS 13
11. SWITCHING AND CONTROL COMMANDS 14

1. Scope

This User Manual provides all the required instructions for using the Universal Protocol, with any Petards products that use the Protocol for Functionality. These may include:

- Speed-Enforcement Systems
- Speed-Enforcement Cameras
- Automatic Number Plate Recognition (ANPR) Systems
- Automatic Number Plate Recognition (ANPR) Cameras
- Various Digital/Analogue AV Recorders approved and supplied by Petards

This Document supersedes Document EIMC/04/0127 Issue 03, and should be used for future reference on Universal Protocol.

2. Change History

Issue Number	Date	Description
1	04/03/2009	Initial Issue (Supersedes EIMC/04/0127 Issue 03)
2	02/04/2009	New commands added for the Kestrel camera

3. Applicability

This User Manual for the Universal Protocol Instruction Set can be used with systems supplied/approved by Petards Ltd. UK. These systems include -

- Provida 2000 Main/Modular Speed Enforcement Systems
- ANPR Systems (Microbus MDT-7 and/or MPC-2 Based)
- HawkPlus 1i and 2i Camera Variants
- MiniHawk 1i and 2i Camera Variants
- Kestrel and Provida 480 Camera Variants
- Recording Units for above-mentioned Systems (Hi8 GVD Systems / X200 HDR Systems / VCR Systems)
- FEROS System

4. Related Documents

This Document supersedes Document EIMC/04/0127 Issue 03.

5. Hazards and Notes

N/A

6. Process flowchart

N/A

7. Introduction to Universal Protocol (UP)

The Universal Protocol was developed for ease of use and to minimise system response delays of the EIMC Remote Observation Systems when commands are sent via wireless RF links. These generally apply a preamble and use some form of encoding (e.g. Manchester) and this significantly increases the number of bits transmitted and therefore the total transmission time. The Universal Protocol is also effective when multiple system components are daisy chained with each device storing and interpreting the command and only passing on if for a downstream device. The protocol normally operates over RS232 links at 9K6Bit/s (9600, 8, n, 1).

The protocol is ASCII text based and generally consists of three characters terminated by a <CR>. It includes commands for cameras, pan/tilt heads, VCR's and peripheral devices. Receiving devices have a timeout of 5 seconds that ensures that any device can easily be controlled manually from a basic PC using Hyper Terminal or from a simple application program. Line feed characters are also trapped and ignored allowing Hyper Terminal to be set to append line feeds and echo typed characters locally. This allows each text string to be viewed on a separate line for ease of operation.

The following sections describe the commands for each class of equipment.

8. CAMERA COMMANDS

Camera setting commands do not return replies. Also note that commands will only be effective if the associated camera incorporates the selected feature.

ZTx	Start zoom tele where 'x' is a speed value between 0 to 7
ZWx	Start zoom wide where 'x' is a speed value between 0 to 7
ZST	Stop zoom
Zxx	Optical zoom direct where 'x' is a decimal value between 00 to 18
ZD1	Digital zoom on
ZD0	Digital zoom off
FNx	Start manual focus near (when auto focus off) where 'x' is a speed value between 0 to 7
FFx	Start manual focus far (when auto focus off) where 'x' is a speed value between 0 to 7
FST	Stop focus
Fxx	Focus direct where 'x' is a decimal value between 00 to 99
FA1	Auto focus on
FA0	Auto focus off (manual)
AEA	Exposure mode fully automatic
AEM	Exposure mode manual
AES	Exposure mode shutter priority
AEI	Exposure mode iris priority
APx	Aperture gain where 'x' is an ASCII HEX value between 0 to F.
APX	Aperture gain reset
SPx	Shutter speed (when in manual or shutter priority) where 'x' is an ASCII HEX value between 0 to F – see shutter table
IPx	Iris aperture (when in manual or iris priority) where 'x' is an ASCII HEX value between 0 to F – see iris table
GPx	Gain (when in manual only) where 'x' is an ASCII HEX value between 0 to F – see gain table
BL1	Backlight compensation on
BL0	Backlight compensation off
BDx	Backlight compensation level where 'x' is an ASCII HEX value between 0 to F – see backlight compensation table
SS1	Slow shutter (integration) auto
SS0	Slow shutter (integration) manual
XM1	IR cut filter out (when in manual IR) for high sensitivity mono
XM0	IR cut filter in (when in manual IR) for normal sensitivity colour
XA1	IR cut filter operation fully automatic
XA0	IR cut filter operation manual
	Note: The above commands are only effective for modules with switched IR cut filter.

WB0	White balance auto
WB1	White indoor
WB2	White outdoor
WB3	White balance one push
WB4	White balance auto tracing
WB5	White balance manual
WBF	White balance one push trigger
GBx	White balance blue gain where 'x' is an ASCII HEX value between 0 to F
GBX	White balance blue gain reset
GRx	White balance red gain where 'x' is an ASCII HEX value between 0 to F
GRX	White balance red gain reset
WD1	Data display on
WD0	Data display off
WF1	*Picture flip on (certain modules only)*[1]
WF0	*Picture flip off*
WR1	Picture left/right reverse on
WR0	Picture left/right reverse off
WZ1	Picture freeze on
WZ0	Picture freeze off
MC1	**Audio Microphone on (Kestrel 10 plus only)**[2]
MC0	**Audio Microphone off (Kestrel 10 plus only)**
YX1	*External synchronisation on (line lock)*
YX0	*External synchronisation off*
YUx	*External synchronisation phase adjust increment where 'x' is step value between 0 to 7*
YDx	*External synchronisation phase adjust decrement where 'x' is step value between 0 to 7*
YST	*External synchronisation phase adjustment stop*
YRS	*External synchronisation phase adjustment reset*
PSx	Set preset where 'x' is a value between 0 to 6
PCx	Clear preset where 'x' is a value between 0 to 6
PRx	Recall preset where 'x' is a value between 0 to 6 Note: It is not necessary to clear presets before setting, clear is only required to make preset inactive. Preset 0 is default setting that camera assumes on power up. Data display setting (WDx) is only remembered for preset 0.

[1] Commands in italics are for IR cameras
[2] Commands in bold are new features for the Kestrel camera

QVS	**Returns the Control Software Version**
QVC	**Returns the Camera Software Version**
QZP	**Returns the Zoom position**
QFP	**Returns the Focus position**

Wx	LED illuminator on period width where 'x' is an ASCII value between 0 to K (i.e. 20 increments) and represents the width in increments of 100uS to a maximum of 2mS.
YNx	LED illuminator on period negative offset where 'x' is an ASCII value between 0 to V (i.e. 31 increments) and represents a negative offset in increments of 100uS
YPx	LED illuminator on period positive offset where 'x' is an ASCII value between 0 to V (i.e. 31 increments) and represents a positive offset in increments of 100uS Note: The above commands are only effective if an illuminator is provided. YW0 effectively turns LED illuminator off.
ST1	Shutter tracking on (LED illuminator on period automatically tracks shutter open period)
ST0	Shutter tracking off Note: Maximum LED illuminator on period is 2mS except in sequential shutter mode. Shutter speeds of less than 1/50th (or 1/60th NTSC) automatically turn illuminator off
SQ0	Sequential shutter off
SQx	Sequential shutter on where 'x' is a decimal value between 1 to 9 – see sequential shutter table Note: LED illuminator on period automatically tracks shutter speed in sequential mode up to a maximum of 3mS.

Shutter Table

ASCII HEX value	Sony IX11 PAL	Sony FCB PAL	Sony FCB NTSC	Pacific VPC PAL
0	1 Sec	1 Sec	1 Sec	1/50th
1	1/2lf	1/3rd	1/4th	1/120th
2	1/3rd	1/6th	1/8th	1/250th
3	1/6th	1/12th	1/15th	1/500th
4	1/12th	1/25th	1/30th	1/1000th
5	1/25th	1/50th	1/60th	1/2000th
6	1/50th	1/100th	1/120th	1/4000th
7	1/75th	1/215th	1/250th	1/10000th
8	1/100th	1/600th	1/500th	1/20000th
9	1/120th	1/1000th	1/1000th	1/30000th
A	1/150th	1/1250th	1/1500th	
B	1/215th	1/1750th	1/2000th	
C	1/300th	1/2500th	1/3000th	
D	1/425th	1/3500th	1/4000th	
E	1/600th	1/6000th	1/6000th	
F	1/1000th	1/10000th	1/10000th	
G	1/1250th			
H	1/1750th			
I	1/2500th			
J	1/3500th			
K	1/6000th			
L	1/10000th			

NOTE: For the MiniHawk 1i and 2i Camera Variants, Shutter Speed should not be set to faster than 1/30000th. Refer to Shutter Table for ASCII HEX Values for Pacific VPC Camera Modules.

Iris Table

ASCII HEX value	Sony IX11 PAL/NTSC	Sony FCB PAL/NTSC
0	CLOSED	F1.4
1	F28	F1.6
2	F22	F2.0
3	F19	F2.4
4	F16	F2.8
5	F14	F3.4
6	F11	F4.0
7	F9.6	F4.8
8	F8.0	F5.6
9	F6.8	F6.8
A	F5.6	F8.0
B	F4.8	F9.6
C	F4.0	F11
D	F3.4	F14
E	F2.8	F16
F	F2.4	F22
G	F2.0	
H	F1.8	

Gain Table

ASCII HEX value	Sony IX11 PAL/NTSC	Sony FCB PAL/NTSC	Pacific VPC PAL
0	-3dB	-3dB	0dB
1	0dB	0dB	2dB
2	+2dB	+2dB	4dB
3	4dB	4dB	6dB
4	6dB	6dB	8dB
5	8dB	8dB	10dB
6	10dB	10dB	12dB
7	12dB	12dB	14dB
8	14dB	14dB	16dB
9	16dB	16dB	18dB
A	18dB	18dB	20dB
B	20dB	20dB	22dB
C	22dB	22dB	24dB
D	24dB	24dB	
E	26dB	26dB	
F	28dB	28dB	

Backlight Compensation Table

ASCII HEX value	
0	-10.5dB
1	-9dB
2	-7.5dB
3	-6dB
4	-4.5dB
5	-3dB
6	-1.5B
7	0dB (default)
8	+1.5dB
9	+3dB
A	+4.5dB
B	+6dB
C	+7.5dB
D	+9dB
E	+10.5dB
F	Reset

Sequential Shutter Table (1/x Sec)

	PAL	NTSC
SQ1 – 3 level	1000	1000
	3500	4000
	10000	10000
SQ2 – 3 level	600	500
	2500	2000
	6000	6000
SQ3 – 3 level	215	250
	1000	1000
	2500	3000
SQ4 – 3 level	600	500
	1000	1000
	2500	3000
SQ5 – 3 level	215	250
	600	500
	1000	1000
SQ6 – 5 level	600	500
	1000	1000
	2500	3000
	6000	6000
	10000	10000
SQ7 – 5 level	215	250
	600	500
	1000	1000
	2500	3000
	6000	60000
SQ8 – 5 level	600	500
	1000	1000
	2500	3000
	3500	6000
	6000	10000
SQ9 – 5 level	215	250
	600	500
	1000	1000
	2500	2000
	3500	4000

9. PAN/TILT COMMANDS

Pan/tilt commands that store position data return an ACK/NAK response on completion. Preset commands return an ACK response when position has been reached.

Lxx	Start pan left where 'xx' is a speed value between 00 to 99
Rxx	Start pan right where 'xx' is a speed value between 00 to 99
Uxx	Start tilt up where 'xx' is a speed value between 00 to 99
Dxx	Start tilt down where 'xx' is a speed value between 00 to 99 Note: A value of 00 in any of the commands above will stop pan or tilt respectively
JLx	Jog pan left where 'x' is the number of steps from 0 to 9
JRx	Jog pan right where 'x' is the number of steps from 0 to 9
JUx	Jog tilt up where 'x' is the number of steps from 0 to 9
JDx	Jog tilt down where 'x' is the number of steps from 0 to 9
PSx	Set preset where 'x' is a value between 0 to 9
PCx	Clear preset where 'x' is a value between 0 to 9
PRx	Recall preset where 'x' is a value between 0 to 9
PH0	Recall home position (mid point) Note: It is not necessary to clear presets before setting, clear is only required to make preset inactive. Preset 0 is default setting that camera and pan/tilt assumes on power up. Only presets 0 to 6 are remembered by camera
MSL	Set pan left limit
MSR	Set pan right limit
MSU	Set tilt up limit
MSD	Set tilt down limit
MCL	Clear pan left limit
MCR	Clear pan right limit
MCU	Clear tilt up limit
MCD	Clear tilt down limit
MCA	Clear all limits
QFP	Read pan pot
QFT	Read tilt pot
QFQ	Read pan position from memory
QFU	Read tilt position from memory
QML	Read left limit position from memory
QMR	Read right limit position from memory
QMU	Read up limit position from memory
QMD	Read down limit position from memory

10. VIDEO RECORDER COMMANDS

Video Recorder commands do not return replies. Only devices that are capable of duplex operation (playback whilst recording etc.) respond to the individual stop commands, otherwise the universal stop command should be used.

VP0	Stop playback
VP1	Start playback
VP2	Rewind and play from mark (frame count 0 position)
VR0	Stop recording
VR1	Start recording Note: When recording starts the counter is zeroed and will become the mark position. If a start recording command is received whilst already recording, the counter will also be zeroed.
VU0	Pause/still off
VU1	Pause/still on
VF0	Stop fast forward
VF1	Start fast forward Note: Operation of fast forward during normal playback will advance at high speed. Operation during paused playback will advance by a single step.
VW0	Stop rewind
VW1	Start rewind Note: Operation of rewind during normal playback will rewind at high speed. Operation during paused playback will rewind by a single step.
VS0	Toggle record speed Note: This function only operates with time lapse VCR's and toggles between 3Hr, 12Hr and 24Hr operation.
VX0	Universal stop

11. SWITCHING AND CONTROL COMMANDS

Switching and Control commands do not return replies.

Cx0 Select camera where ‘x’ is an ASCII HEX value between 1 to 4.